

1 **WE CLAIM:**

1 1. A disk drive, comprising:

2 a cache memory having a plurality of sequentially-ordered memory clusters for  
3 caching disk data of disk sectors identified by logical block addresses; and

4 a cache control system having

5 a plurality of cluster control blocks, each cluster control block having a  
6 cluster segment record for associating the cluster control block with a particular memory  
7 cluster and for forming variable length segments of the memory clusters without regard to  
8 the sequential order of the memory clusters;

9 a tag memory having a plurality of tag records, each tag record for  
10 assigning a segment to a contiguous range of logical block addresses and for defining the  
11 cluster control blocks forming the segment, and each segment of the memory clusters for  
12 caching disk data of the assigned contiguous range of logical block addresses.

1 2. A disk drive as defined in claim 1, wherein the cluster segment record of each cluster  
2 control block associated with a segment includes a pointer to a subsequent cluster control block  
3 or to indicate an end cluster control block of the segment.

1 3. A disk drive as defined in claim 1, wherein each tag record defines a length for the  
2 assigned segment by pointing to a first cluster control block and to a last cluster control block for  
3 the segment.

1 4. A disk drive as defined in claim 1, wherein each tag record defines a length for the  
2 assigned segment by pointing to a first cluster control block and indicating a count of cluster  
3 control blocks for the segment.

1           5. A disk drive as defined in claim 1, further comprising a free list for identifying cluster  
2 control blocks not associated with a tag memory record and forming a segment of the identified  
3 cluster control blocks; wherein each tag record for an assigned segment points to a first cluster  
4 control block, a last cluster control block, and indicates a count of the disk sectors cached for the  
5 segment, and wherein a length of an original assigned segment may be increased by removing a  
6 segment of cluster control blocks from the free list segment, changing the original segment's last  
7 cluster control block to point to a first cluster control block of the removed segment, and  
8 changing the tag record to point to the last cluster control block of the removed segment

1           6. A disk drive as defined in claim 1, further comprising a microprocessor that de-  
2 allocates an existing assigned segment and assigns the segment's associated cluster control  
3 blocks to a free list if a sufficient number of cluster control blocks are not available on the free  
4 list to enable caching of a range of logical block addresses requested by a host command.

1           7. A disk drive as defined in claim 1, wherein the memory clusters are uniformly sized.

1           8. A cache control system for caching disk data of disk sectors identified by logical block  
2 addresses using a cache memory having a plurality of sequentially- ordered memory clusters,  
3 comprising:

4           a plurality of cluster control blocks, each cluster control block having a cluster segment  
5 record for associating the cluster control block with a particular memory cluster and for forming  
6 variable length segments of the memory clusters without regard to the sequential order of the  
7 memory clusters; and

8           a tag memory having a plurality of tag records, each tag record for assigning a segment to  
9 a contiguous range of logical block addresses and for defining the cluster control blocks forming  
10 the segment, and each segment of the memory clusters for caching disk data of the assigned  
11 contiguous range of logical block addresses.

1           9. A cache control system as defined in claim 8, wherein the cluster segment record of  
2 each cluster control block associated with a segment includes a pointer to a subsequent cluster  
3 control block or to indicate an end cluster control block of the segment.

1           10. A cache control system as defined in claim 8, wherein each tag record defines a  
2 length for the assigned segment by pointing to a first cluster control block and to a last cluster  
3 control block for the segment.

1           11. A cache control system as defined in claim 8, wherein each tag record defines a  
2 length for the assigned segment by pointing to a first cluster control block and indicating a count  
3 of cluster control blocks for the segment.

1           12. A cache control system as defined in claim 8, further comprising a free list for  
2 identifying cluster control blocks not associated with a tag memory record and forming a  
3 segment of the identified cluster control blocks; wherein each tag record for an assigned segment  
4 points to a first cluster control block, a last cluster control block, and wherein a length of an  
5 original assigned segment may be increased by removing a segment of cluster control blocks  
6 from the free list segment, changing the original segment's last cluster control block to point to a  
7 first cluster control block of the removed segment, and changing the tag record to point to the last  
8 cluster control block of the removed segment.

1           13. A cache control system as defined in claim 8, further comprising a microprocessor  
2 that de-allocates an existing assigned segment and assigns the segment's associated cluster  
3 control blocks to a free list if a sufficient number of cluster control blocks are not available on  
4 the free list to enable caching of a range of logical block addresses requested by a host command.

1           14. A cache control system as defined in claim 8, wherein the memory clusters are  
2 uniformly sized.

1           15. A method for caching disk data of disk sectors identified by logical block addresses  
2    using a cache memory having a plurality of sequentially-ordered memory clusters, comprising:  
3           providing a plurality of cluster control blocks, each cluster control block having a cluster  
4    segment record for associating the cluster control block with a particular memory cluster and for  
5    forming variable length segments of the memory clusters without regard to the sequential order  
6    of the memory clusters;  
7           assigning a segment to a contiguous range of logical block addresses; and  
8           defining the cluster control blocks forming the segment, each segment of the memory  
9    clusters for caching disk data of the assigned contiguous range of logical block addresses.

1           16. A method for caching disk data as defined in claim 15, wherein the cluster segment  
2    record of each cluster control block of a segment includes a pointer to a subsequent cluster  
3    control block or to indicate an end cluster control block of the segment.

1           17. A method for caching disk data as defined in claim 15, further comprising allocating  
2    an existing assigned segment and assigning the segment's associated cluster control blocks to a  
3    free list if a sufficient number of cluster control blocks are not available on the free list to enable  
4    caching of a range of logical block addresses requested by a host command.

1           18. A method for caching disk data as defined in claim 15, wherein the memory clusters  
2    are uniformly sized.

1           19. A disk drive as defined in claim 1, wherein the cache memory is separate from the  
2    tag memory of the cache control system.

1           20. A cache control system as defined in claim 8, wherein the tag memory is separate  
2    from the cache memory.